#16
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7-9-03

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of)
)
Raith)
)
Serial No.: 09/498,772)
)
Filed: 2/5/00)
)
For: **SYSTEM AND METHOD FOR IMPROVING CHANNEL MONITORING IN A CELLULAR SYSTEM**)
)
Attorney's Docket No. 4015-398

Examiner
Davis, Temica M.
Art Unit 2681

DECLARATION OF ALEX KRISTER RAITH

I, Alex Krister Raith, hereby declare as follows:

1) Not later than May 31, 1999, I conceived an invention tentatively entitled "Neighbor Cell Measuring Method." The invention was conceived while employed at Ericsson Inc. An Invention Disclosure describing my invention was prepared not later than May 31, 1999. A partially redacted copy of that Invention Disclosure is attached as Exhibit 1. No dates are redacted in that copy. The internal tracking number initially assigned to this Invention Disclosure was EUS03193-RMOT, but was subsequently changed to P10569-BMOT.

2) My invention was approved for patenting by Ericsson Inc. in June 1999, and the Invention Disclosure was forwarded to an outside patent counsel working with Ericsson Inc. on or about June 28, 1999, with a request to prepare and file a patent application. A copy of the corresponding instruction cover letter to the patent counsel is attached as Exhibit 2 hereto.

3) A draft patent application covering my invention was prepared by patent counsel and sent to by me for comments on or about October 6, 1999. A copy of the corresponding cover letter is attached hereto as Exhibit 3. After revisions to the application based on my comments, and preparation of at least one more draft, the application was filed with the U.S.P.T.O. on or about February 5, 2000, receiving U.S. Application Serial No. 09/498,772.

4) The invention claimed in U.S. Application Serial No. 09/498,772, of which I am a named inventor, was conceived before August 1999 and pursued with reasonable diligence until the filing of the corresponding application on or about February 5, 2000.

I hereby declare that all statements made herein of my knowledge are true and that all statements made on information and belief are believed to be true, and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under §1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

June 23, 2003
Date

Alex Krister Raith
Alex Krister Raith

P10569

Referee's Recommendation	For Legal Operation Use
Name: [redacted] Date: 14 JUN 99	Docket Number: EUS03193 - RMOT
Check Recommendation: ☒ File: Disclosure Complete ☐ Do Not File (Specify Reasons) ☐ File: Prepare Full Disclosure ☐ Review Further ☐ Publish in TDB ☐ Keep as Formal Trade Secret	Date Opened: 1999-06-08 TMC/PD/MCT
Referee's Comments: [redacted]	

Ericsson Inc. Invention Disclosure Cover Form

EXHIBIT 1

1. **Invention Title:** Neighbor Cell Measureing Method

2. **Disclosure Submitted by (Add additional sheets if more than three inventors):**

	Inventor No. 1	Inventor No. 2	Inventor No. 3
(a) Full Name	Alex Krister Raith		
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(e) 5-Digit Pay No.	23663		
(f) Manager	Mike Hammer	Patent Engineering Dept	
(g) Bus. Unit	RMOA/RMOG		
(h) Cost Center	L72-550		

3. **Business Unit to which patent expenses should be charged:** RMOT

4. **Date invention conceived (mm/dd/yy):** 5/1/99 5. **Date invention reduced to practice:**

6. **Identify (including dates) any past or anticipated disclosure outside the company, such as publication, offer for sale, actual sale, discussions with business partners, etc.:**

7. **Invention made using government or non-Ericsson funding?:** No

8. **Present or proposed use of the invention (identify products and dates):** Future

9. **Identify related invention disclosures of which you are aware:** See disclosure

10. **Please attach to this cover form your invention disclosure, along with any other relevant documentation (see "IPR at RTP" Web site for additional information on writing disclosures).**

The invention described in the attached invention disclosure is hereby submitted under my employment agreement with Ericsson Inc.

Inventor's Full Signature	Date	Witnessed, read, understood and signed by	Date
(1) Krister Raith	May 31, 99	(1)	
(2)		(2)	
(3)		(3)	

Inventor: Submit to Kristen DeSimone, Davis-2B, Cubicle #2421, x7711. Revision: 08/06/98

Neighbor Cell Measuring Method

BACKGROUND AND PRIOR ART

The present invention relates generally to the management of mobile stations in a wireless communication system and, more particularly, to efficiently evaluate channels for potential re-assignment of a mobile station to another base station

Cellular Layout

Current wireless systems used for public access, e.g. GSM, ANSI 95 and ANSI 136 are all using multiple bases stations to provide radio coverage for a target area. This increases, for a given amount of available spectrum, the total capacity that can be handled in the service area as is well understood in the prior art. The base stations are typically configured to transmit signals into multiple semi-distinct sectors e.g. using multiple antenna systems. The resulting partially overlapping coverage areas are referred to as cells. When the mobile travel within the service area a call connection has to be moved to the cell which is best suited to handle the call. During idle mode, when the mobile station is powered on and ready to receive or place calls, the mobile station is monitoring the downlink control channel. The system does not know, beyond the registration area which typically covers multiple cells, where the mobile is located. Thus, during idle mode the mobile must itself determine which cell it shall listen to. The process of having the mobile station selecting the ìbestî cell while in idle mode is commonly referred as the cell reselection process.

Handoff

During active mode, when a circuit switched call is in place, e.g. a voice call or a circuit switched data call, the system is typically responsible for making the decision which cell(s) should handle the connection. More than one cell may handle the call which provides macroscopic diversity, see USRE036017: ìCellular digital mobile radio system and method of transmitting information in a digital cellular mobile radio systemî which hereby is expressively incorporates by reference.

When a call is set up the system typically sends a message containing frequencies and potential other attributes such as the identity of the cell to the mobile station. The mobile measures signal strength and potentially confirms that the strongest signal is from the intended cell by verifying the cell identity. The mobile station average multiple measurements (low pass filtering) to reduce the impact of Rayleigh fading and reports the result to the base station. A report is typically sent on the order of every second. The system may use the report in addition to measurement by current and surrounding base station on the transmitted signal from the mobile station to evaluate which base station would best serve the mobile station. If another channel is deemed better (on current or other base station), the base station sends a handoff command to the mobile station to switch channel. Alternatively, the system may use ìsoftî handoff in which the change from one base station to another may be less disruptive and the mobile may stay on the same frequency. The interested reader is referred to USRE036078: ìHandover method for mobile radio Systemî,

which hereby is expressively incorporated by reference. The process of letting the mobile station assist the system in determining the best channel and base station by providing measurement of the downlink from several channels is commonly referred to as Mobile Assisted Handoff (MAHO). The list of channels given to the mobile station at the start of the call and after a handoff is referred to as the MAHO List (ML).

Cell Reselection

When the mobile is powered on ready to receive or place calls, the mobile station is listening to the control channel of a base station monitoring whether it is paged or for other instructions (e.g. registration). This state of operation is commonly referred as the idle state or idle mode. Since there is no two-way communication in place while in idle mode, the system can not know which base station the mobile station should listen to. The mobile measure signal strength (and/or other channel quality indicatives such as an estimate of readability) in order to determine which cell it should listen to. In old analog system this would typically be the base station with the strongest received signal. In modern digital systems, e.g. ANSI 136, supporting hierarchical cell structures, the mobile station performs a much more elaborate evaluation of the candidate cells. The interested reader is referred to {search: Ake Karlsson @ Ericsson, filed by BDSM} and to ANSI 136.

The mobile station acquires the information of the channels (and other attributes) used or associated with surrounding (or overlaying/underlying) cells by reading a list of channels sent on a broadcast channel typically transmitted by each cell. This list is commonly referred to as the Neighbor List (NL).

Circuit switched vs. Packet switched

For circuit switched data communication, the MAHO based handoff methods are typically used, i.e. the mobile assist with measurements and the systems controls the channel allocation.

Since the mobile is continuously allocated an uplink channel, as for a voice call, the reports are typically sent on a call associated control channel.

For a packet data session however, the mobile may for an extensive period not transmit any payload information and sending a MAHO report would unnecessary make use of the shared (amongst multiple mobiles) uplink channel. Hence, the packet data protocols therefore typically specify that the mobile itself shall find the best channel. The system relinquishes control in order to save bandwidth.

The process of allocating the mobile station to the ìbestî base station while having an active packet data session is therefore similar or identical to the cell reselection process while in idle mode. The NL is received from the system and the mobile station measures and evaluates the candidate cells based on channel quality. However, nothing prevents a hybrid solution in which some MAHO measurement is reported and the system can override the default cell reselection process by sending a ìhandoffî command. The GPRS packet data protocols supports mobile station and network initiated cell reselection

Constraints
There are implications of letting the mobile station evaluating neighboring cells. The implication is dependent on what mode of operation the mobile station is operating in.

1. *Active mode*:
In TDMA systems, the number of time slots per TDMA frame is made large enough such that there is ample amount of time for the mobile during non-assigned time slots to be able to perform NL/ML measurement. However, for multi slot operation, e.g. when the mobile station is allocated all available time slots, there is no spare time for NL/ML measurement

2. *Idle mode*:
During idle mode, the time availability is not an issue. The objective for the mobile station is to minimize its current consumption but still fulfill the tasks associated with the idle state (monitoring the assigned page channel and perform NL measurement).

Prior Art
The prior art describes methods minimizing the impact, of the above-identified constraints.

0 Active Mode

When the mobile station is operating in a mode where not ample time is available for NL/ML measurements, a second receiver must be implemented or the mobile station has to stop transmitting/receiving data in order to perform the ML measurement. This is referred as frame stealing in {027555-802 ?}, which hereby is expressively incorporated by reference. Frame stealing reduces transmission/reception of payload data, i.e. a reduction of the throughput. The data protocol typically includes re-transmission, so there is no permanent loss of data. Data transmitted by the base station during frame stealing will be retransmitted by the Radio Link Protocol. The trade off becomes the amount of stealing vs. accuracy of measurement (loss of throughput vs. measurement accuracy).

The frame stealing can be of two types:

- *Scheduled stealing*
  the system sends time information when the mobile is allowed/requested to perform the NL/ML measurement. The knowledge of the system that the mobile station is not available for data reception/transmission improves the throughput given finite re-transmission buffers and uplink channel usage respectively.

- *Wild stealing*
  the mobile makes an autonomous decision without providing any information to the system about its intention to perform NL/ML measurements.

The implementation of frame stealing can be adapted to the type of connection:

- *Circuit switched*

* A minimum number of measurement per unit of time per entry in the ML may be required in order to maintain the quality of the MAHO report.
* A maximum number of frames are allowed to be stolen, i.e. maximize the time the mobile is allowed to make the specified measurements in order to put a limit on the reduction of data throughput.
These are conflicting requirements which impose an efficient implementation of the mobile station.

- *Packet switched*

Both types of stealing is applicable here too. The requirement on the mobile can be stated little different in order for the mobile to make use to the most possible extent the pauses between reception/transmission event to make the NL measurements, see ìApparatuses and Method for Signal Strength Measurement in a wireless Communication Systemî, which is hereby expressively incorporated by reference.

Both GSM (GPRS) and ANSI-136 incorporates some or all of the aspects mentioned above in order to handle the active mode NL/ML measurement while in multi-slot operation. For a CDMA system, the availability of time for ML/NL measurement is typically not an issue as long as the NL/ML measurements are restricted to channels on the same frequency as the communication channel.

1 Idle mode

The trade off for idle mode is battery drain vs. accurate measurement. US 5,539,748 ìEnhanced Sleep mode in a Radiocommunication Systemsî, which is hereby expressively incorporated by reference discloses several techniques in order for the mobile station to reduce the amount of NL measurements while not sacrificing the quality of the measurements.

There are two types of methods described in US5,539,748:

- *system assisted*
  The system informs the mobile station using the broadcast channel the minimum nominal frequency of measurement for each entry in the NL. The system can provide an indication that some of the entries can be measured with a reduced frequency. This may be applicable if there are many entries in the NL and/or in a hierarchical cell layout.

- *mobile station controlled*
  The mobile is allowed to reduce the measurement frequency from the nominal requirement if certain conditions are detected:
  * if no cell reselection has been performed for a specified time, the mobile may reduce the measurement

* if absolute and/or relative changes of signal strength of the serving control channels and NL entries are less than specified, the mobile station may reduce the frequency of measurement on all or selected NL entries.

The methods described above for idle mode are included in ANSI 136.

SUMMARY

According to exemplary embodiments of the present invention, the objective is to:
1 minimize loss of data throughput measurement
2 minimize the battery drain used for cell reselection
while maintaining high cell-reselection quality during active and idle mode respectively.

The invention is applicable for any multiple access method used e.g. CDMA, FDMA, OFDMA and TDMA or any hybrid form using measurement of signals transmitted from other than current servicing base station for cell reselection purpose.

The cost of manufacturing a Global Positioning System (GPS) receiver has been reduced to a level which makes it affordable in many application, including consumer electronics. The use of GPS receiver for vehicular monitoring, e.g. the Startrack system or for emergency reporting will be commonplace in the near future. Thus, it is expected that future mobile stations will be equipped with a GPS receiver.

The method according to this invention is using position and change of position to determine

- frequency of measurement on neighbor cells
- which cells to measure

in order to minimize the amount of potential frame stealing while in active mode and saving battery consumption during idle mode. Furthermore, the same information can be used to control how frequent position estimates are made.

Each cell in the NL/ML list may be measured with an independent measurement frequency varying from nominal (system or protocol dependent default) to zero.

The system may assist the MS with position related attributes to the entries in the NL/ML list, e.g. the position of the neighboring cellís transmitter. This information can be sent on :

- the broadcast channel (e.g. in the NL message)
- a point-to-point channel (e.g. in the MAHO list message)

BRIEF DESCRIPTION OF THE DRAWINGS

Other features and advantages of the present invention will become apparent from the following detailed description, taken in conjunction with the accompanying drawings, which illustrate, by way of example, the principles of the invention.
FIG. 1 illustrates a [*insert a motherhood figure of cellular system with associated text preferable one showing packet data nodes*]
FIG. 2 show examples of an area definition
FIG. 3 show examples of an area definition

DETAILED DESCRIPTION

Figure 1 shows.....

The mobile is using information associated with position with respect to the cell sites and mobility to determine the state of its cell-reselection measurement procedure. Inputs include:

1. position
2. difference in position or estimated speed
3. time in current state
4. NL/ML attributes
5. prior art techniques

This input is used to determine
- which cells to measure
- how frequent each entry of the NL/ML should be measured

Furthermore, the modified measurement procedure according to this invention, using the inputs as described above, shall avoid or minimize any impact on the quality of the cell-reselection procedure, i.e. cell reselection shall take place at about the same time and to the same cell as the un-modified cell reselection procedure in an existing wireless system or when not invoking the technique in a new system.

The use of position estimate by the mobile station, e.g. using a GPS receiver, may potential conflict with the objective of saving battery in idle mode. However, there may be other applications that dictates position estimate, e.g. for a pre-acquired position used in emergency calling. Furthermore, the frequency of position estimate may be one or more magnitude less than prior-art cell reselection measurement and if no mobility is detected and hence very infrequent NL measurement and position estimates are made there may be a net gain in battery drain too. During active mode, the objective is to minimize the required frame stealing and not the frequency of measurement per se. Hence, during active mode, the battery drain due to performing position estimate is a secondary issue.

The NL/ML may, according to this invention, contain sub-lists specific for a defined area. Each sub-list may contain different NL/ML entries or one entry may be in several sub-lists. The format of the list (NL and/or ML) may be: area1 definition, channel entries for area1, attributes for cell 1; area2 definition, channel entries for area2, attributes for cell 2;..., areaM definition, channel entries for areaM, attributes for cell M. The attributes may include cell-identity, service capability and the poision of the transmitter of the cell. The aspect of providing information about other cells is disclosed in US5353332: ìMethod and apparatus for communication control in a radiotelephone systemî.

Figure 2 and 3 show exemplary sub-division of cells into multiple areas. Note that an specified area, according to the system transmitted information, may overlap each other and furthermore cross the hypothetical cell areas defined as hexagons.

In figure 2, omni-directional cells are assumed. For base station B1, there are three areas. The first area is the area with radius r1, the second is the area within radius r2 but not within the first area. The third area is outside the circle defined by r2. The base station B1 is transmitting the radius r1, r2 and the position of the transmitter. For base station B2, several coordinates are transmitted in groups defining the first area within coordinates P1, P2,...,p6, the second area within the coordinates P5, P6 and P7, the third area within the coordinates P5, P6, P7, P8 and P9. The fourth area is any position not covered by the other three areas. The base station B2 is transmitting the coordinates P1,..,P9 and the group definition. For base station B3 there are four areas defined. The first area is within distance r1 to the base station, the second area is west from the line L1, the third is the area east of L2 and the fourth area is for all remaining position not covered by any of the three other areas. For base station B4, there are three areas defined. The first area is east of line L1, the second are is west of are L1, the third is within distance r1 of coordinate P1. The later are could be of interest when there are private systems located with a cell. Thus, the channel entries for area three may include one or more channels belonging to private systems. The base station B4 is transmitting the coordinates, line definition and groupings as for the other base station. Furthermore, for area 3, the identify of the private system(s) may be included with the channel numbers to measure. A mobile station not subscribing or belonging to the particular private system identity may skip measuring those entries.

In figure 3, sectorized cells are assumed. Each base station has three sectors, S1, S2 and S3. For base station one, the first area is within the coordinates P1, P2 and P3, the second area is within coordinates P1, P2 and P0 (which is the position of the base station), the third area is west of the line L1 and north of line L2, the fourth area is east of L1, north of L2 but not covered by area 1 and area 2, the fifth and sixth area are similar defined with respect to the two lines. The coordinates and lines definition(just a single coordinate is necessary for north-south and east-west aligned lines) and the interpretation are transmitted by base station B1.
When the mobile station has determined its position, it may then:

- measure only the entries associated with the area containing current mobile station position
- measure other entries, e.g. areas neighboring the identified area, with a lesser frequency
- not measure some entries at all (e.g. non-adjacent areaís entries)

The definition of an area of interest can be expressed in many different forms. For example, a set of coordinates, hypothetical connected constitutes an area. Another example is a distance from the position of the cell, making the areas become concentric circles. The center position of the receptive cell is also included in the area-definition.

The method according to this invention, using the 5 inputs described above, are equally well suited for both active and idle mode.

For example, the mobile station is engaged in a packet data session. Assuming the mobile station is ìmulti-slotî capable (e.g. 8 slot GPRS mobile station) it must sometimes omit transmitting/receiving data in order to fulfill the required neighbor cell measurement procedure. This results in reduced data rate throughput. However, for most instances of packet data usage resulting in high data transfer rate, e.g. downloading information from the WEB, the user is not traveling. The user may sit in an airport, a meeting room, in a hotel lobby etc. The mobility detector in the mobile station according to this invention, using position and/or speed estimates, will determine that the mobile station is not moving. The likelihood that a cell reselection would be required, which is the reason to make the cell-reselection measurement in the first place, is relatively low. The longer time ìnon-mobilityî is detected, the more likely that for the next period of time (e.g. seconds) three will not be any movement and cell reselection measurement can be further relaxed. Thus, the time in current ìstateî of the modified cell-reselection procedure may affect the frequency of measurement.

The degree of measurement relaxation may depend on the following:

1. change in position between position estimates
2. estimated speed
3. time spent in current state (i.e. while other inputs are approximately constant)
4. relative position of mobile station to serving cell and respective neighboring cells

The first three relaxation methods may be beyond any specified (in a protocol standard) rules of measurement according to the position of the mobile station with respect to a defined area transmitted by the system (sub-lists and associated measurement rules specified)

If mobility is detected, the procedure can be to:

- immediately revoke all measurement relaxation
- gracefully revoke
- revoke dependent on the degree of mobility
- revoke dependent on relative position between current and respective neighbor cell

For example, if the mobile station is very close to the serving cell, it would take a while for the mobile traveling ~~close~~ to the geographic border and hence before a cell reselection would take place. If the mobile station knows the position of the neighboring base station it can calculate the time required with an assumed speed before it reaches the cell border. This time, assuming a pessimistic speed (i.e. a high speed, e.g. entering into a car going 120 km/h) can be used to set the degree of measurement relaxation and how and how fast to act when mobility is detected. However, cell-reselection can take place far into a cell from its geographic border due to the propagation effect of radio signal is very affected by

shadowing of buildings and hills. Furthermore, in a hierarchical cell structure, cell reselection may take place between cells which may be transmitted from the very same position. To this end, a safety margin should be used when activating and deactivating the measurement relaxation.

The mobile can use the measurement of neighboring cells to predict, not using distances but rather the relative signal strengths, how ìcloseî it may be for a potential cell-reselection or handover.

In active mode, the system determines which cell should be used. It typically uses measurement in the uplink too, which the mobile station does not know. Furthermore, the system may handoff a mobile station because of load sharing (between base stations or sectors) or the channel may be subject to severe interference for which a intra-cell handoff may be advantageous. In principle, the mobile should not second-guess what the system will do. Thus, care should be taken when determining how aggressive the measurement relaxation should be implemented by the mobile station vendor.

In idle mode the situation is more easy since the only thing that affects cell-reselection is the measurements made by the mobile station (in addition to static parameters sent on the broadcast channel as described in e.g. {Ake Karlsson} and ANSI 136 cell reselection procedure). Thus, for this case, the mobile can make more reliable predictions. For example, it may determine that if NL entry X is 10 dB stronger than current channel, then it will make a cell-reselection.

The inputs, as described above, can in addition to affect cell-reselection also affect the frequency of making a position estimate measurement (active and idle mode) to the extent other applications (e.g. emergency call management) allows it.

As mentioned above, US 5,539,748 describes a technique that when the profile of the signal strengths is not changing substantially, a reduced measurement frequency can be invoked. When the profile of measurement is changing, the relaxation must be removed. Yet another part of this invention is for the mobile station to estimate its position when the signal strength profile is changed to see whether the change is due to objects moving around the mobile station or an actual movement of the mobile station has occurred.

CLAIMS

Frequency of NL measurement depends on relative position between 2 BS

A mobile station served by a first base station measuring a signal transmitted from a second base station, the frequency of measuring said signal from said second base station is dependent on the relative distance between said mobile station to said first and said second base station position respectively

- where said mobile station is in idle mode
- - where said positions of said base stations are sent in a message on a broadcast channel
- - - where said message is a neigbourlist message
- - where said measurement is for cell reselection purpose

- where said mobile station is engaged in a packet data session
- - where said positions of said base stations are transmitted from said first base station
- - where said measurement is for cell reselection purpose
- - where said measurement is for MAHO purpose

- where said mobile station is engaged in a circuit switched data call
- - where said positions of said base stations are transmitted from said first base station
- - where said measurement is for MAHO purpose

Frequency of MS position update depends on relative position between 2 BS

A mobile station served by a first base station measuring a signal transmitted from a second base station, said mobile station is estimating itís position with a frequency which is dependent on the relative distance between said mobile station to said first and said second base station position respectively

- where said mobile station is in idle mode
- - where said positions of said base stations are sent in a message on a broadcast channel
- - - where said message is a neigbourlist message
- - where said measurement is for cell reselection purpose

- where said mobile station is engaged in a packet data session

-- where said positions of said base stations are transmitted from said first base station
-- where said measurement is for cell reselection purpose
-- where said measurement is for MAHO purpose

- where said mobile station is engaged in a circuit switched data call
-- where said positions of said base stations are transmitted from said first base station
-- where said measurement is for MAHO purpose

Frequency of NL measurement depends on relative position within the cell

A mobile station served by a first base station measuring a signal transmitted from a second base station, the frequency of measuring said signal from said second base station is dependent on the distance between said mobile station to said first base station

- where said mobile station is in idle mode
-- where said positions of said base stations are sent in a message on a broadcast channel
--- where said message is a neigbourlist message
-- where said measurement is for cell reselection purpose
-- *where said first base station is sending a cell-size parameter*

- where said mobile station is engaged in a packet data session
-- where said positions of said base stations are transmitted from said first base station
-- where said measurement is for cell reselection purpose
-- where said measurement is for MAHO purpose
-- *where said first base station is sending a cell-size parameter*

- where said mobile station is engaged in a circuit switched data call
-- where said positions of said base stations are transmitted from said first base station
-- where said measurement is for MAHO purpose
-- *where said first base station is sending a cell-size parameter*

Frequency of MS position update depends on relative position within cell

A mobile station served by a first base station measuring a signal transmitted from a second base station, said mobile station is estimating itís position with a frequency which is dependent on the distance between said mobile station to said first base station

- where said mobile station is in idle mode
-- where said positions of said base stations are sent in a message on a broadcast channel
--- where said message is a neigbourlist message
-- where said measurement is for cell reselection purpose
-- *where said first base station is sending a cell-size parameter*

- where said mobile station is engaged in a packet data session

- - where said positions of said base stations are transmitted from said first base station
- - where said measurement is for cell reselection purpose
- - where said measurement is for MAHO purpose
- - *where said first base station is sending a cell-size parameter*

- where said mobile station is engaged in a circuit switched data call
- - where said positions of said base stations are transmitted from said first base station
- - where said measurement is for MAHO purpose
- - *where said first base station is sending a cell-size parameter*

Frequency of NL measurement depends on mobility

A mobile station served by a first base station measuring a signal transmitted from a second base station, the frequency of measuring said signal from said second base station is dependent on an in the mobile station estimated mobility

- *where said mobility is determined from a set of estimated positions and corresponding time of measurement.*
-- where said mobile station is in idle mode
--- where said measurement is for cell reselection purpose
-- where said mobile station is engaged in a packet data session
--- where said measurement is for cell reselection purpose
--- where said measurement is for MAHO purpose
-- where said mobile station is engaged in a circuit switched data call
--- where said measurement is for MAHO purpose

Frequency of MS position update depends on mobility

A mobile station served by a first base station measuring a signal transmitted from a second base station, said mobile station is estimating itís position with a frequency which is dependent on an in the mobile station estimated mobility

- *where said mobility is determined from a set of estimated positions and corresponding time of measurement*
-- where said mobile station is in idle mode
--- where said measurement is for cell reselection purpose
-- where said mobile station is engaged in a packet data session
--- where said measurement is for cell reselection purpose
--- where said measurement is for MAHO purpose
-- where said mobile station is engaged in a circuit switched data call
--- where said measurement is for MAHO purpose

Frequency of NL measurement depends on mobility & relative position 2 BS

{ copy and paste from above...! }

Frequency of MS position update depends on mobility & relative position 2 BS

{ copy and paste from above...! }

Frequency of NL measurement depends on mobility & relative within cell

{ copy and paste from above...! }

Frequency of MS position update depends on mobility & relative within cell

{ copy and paste from above...! }

A system transmitting a neighbor list including the position of the neighbors

- where said list is transmitted on a broadcast channel
- where said list is transmitted on a point-to-point channel

A system transmitting multiple NL/ML lists where each list is associated to areas being at least partial distinct.

- where said list is transmitted on a broadcast channel
- where said list is transmitted on a point-to-point channel

A mobile station including means for estimating position, using position estimate and the duration of current position conditions to determine frequency of NL/ML measurements

- where the frequency of position estimates are also dependent on said conditions

A mobile station revoking a relaxed measurement procedure based on relative distance .

- and degree of mobility

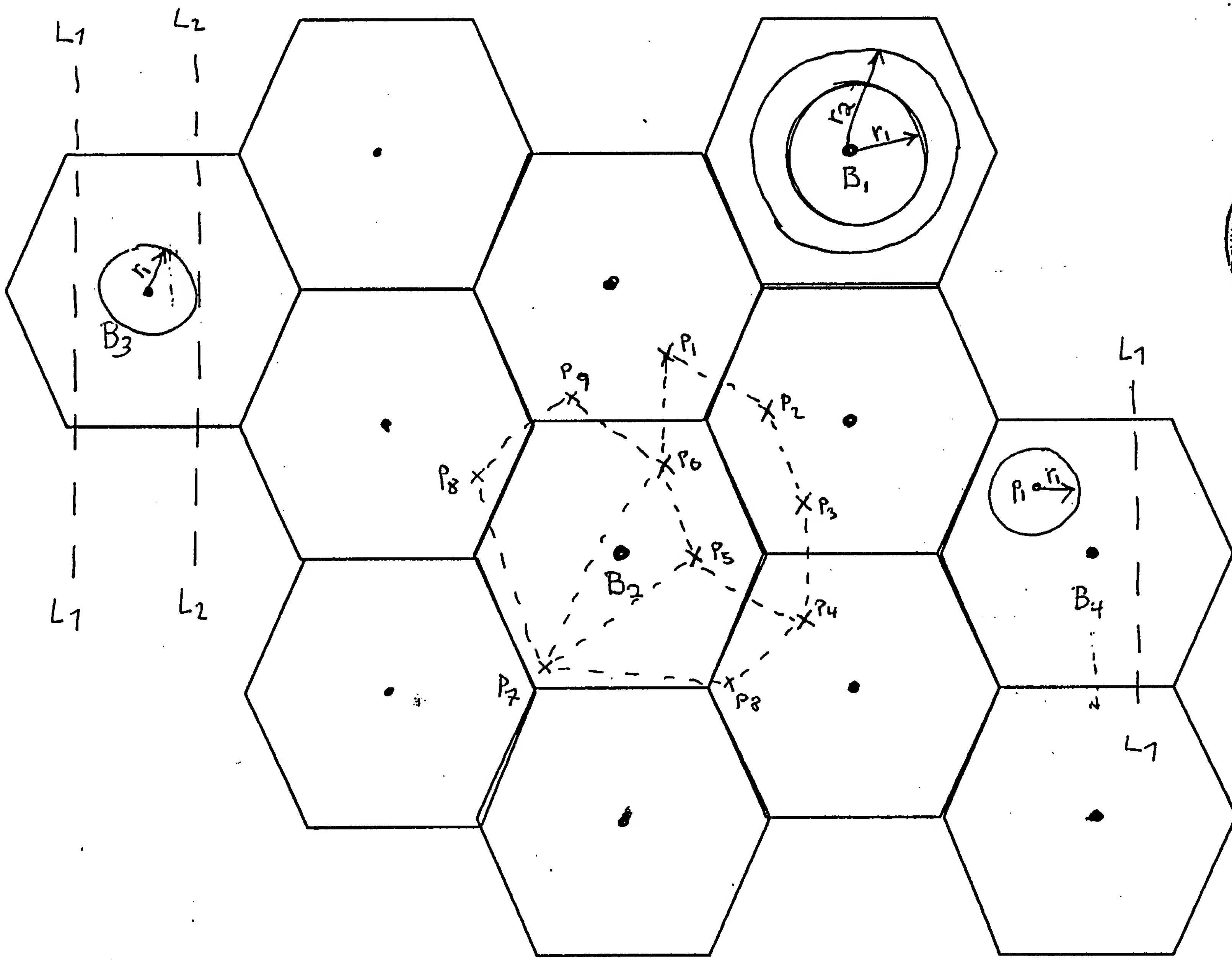

Figure 2
(Neighbor Cell Measuring Method)

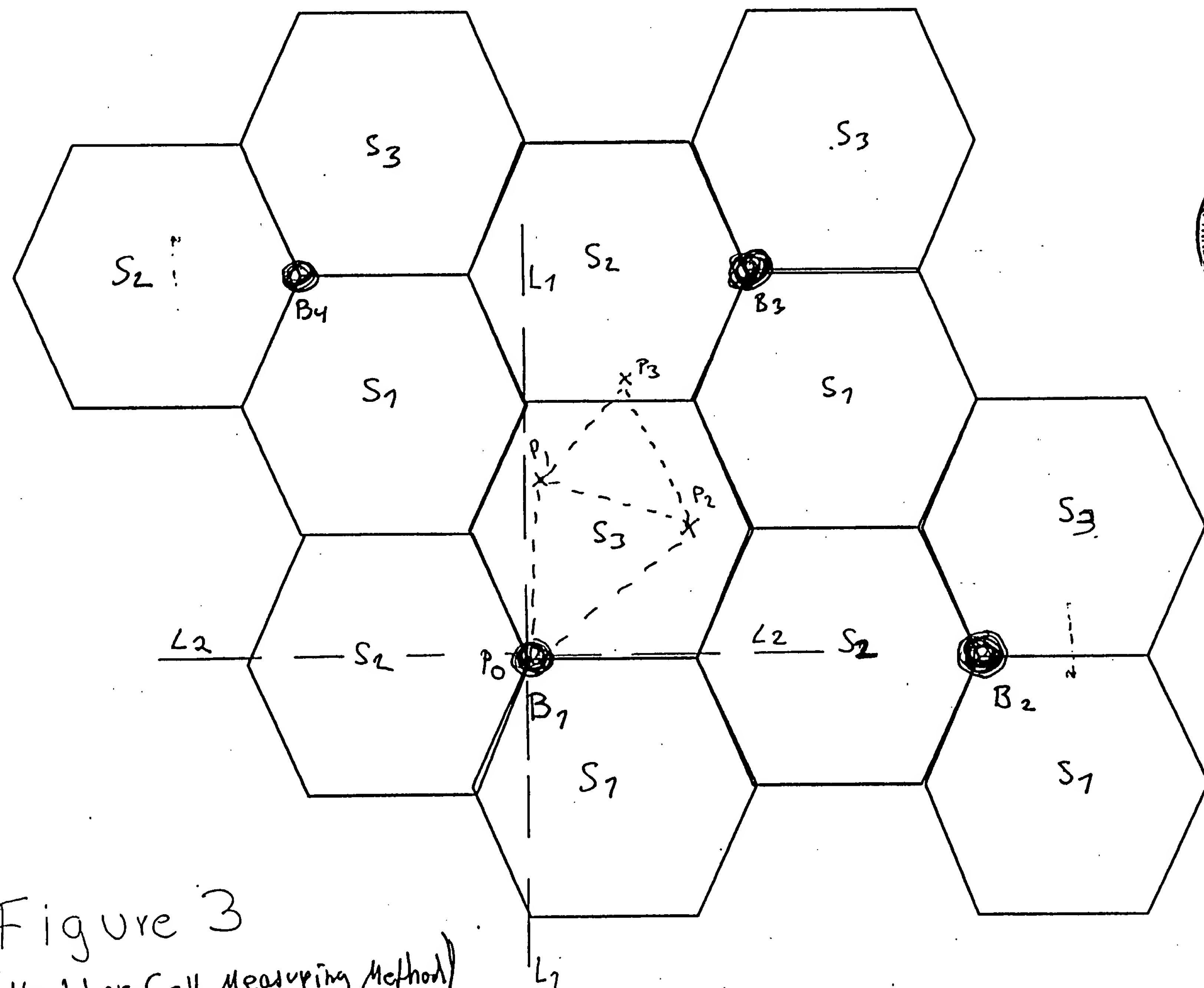

Figure 3
(Neighbor Cell Measuring Method)

ERICSSON

OIPE JC22
JUL 0 7 2003
PATENT & TRADEMARK OFFICE

EXHIBIT 2

June 28, 1999

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VIA FEDERAL EXPRESS

David E. Bennett, Esq.
Coats & Bennett
1100 Crescent Green, Suite 206
Cary, North Carolina 27511

REQUEST TO PREPARE AND FILE PATENT APPLICATION

RE: Ericsson Docket No.: P10569-US1-BMOT
Title: **NEIGHBOR CELL MEASURING METHOD**
Inventor: Alex Krister Raith

Dear David:

THIS CASE IS ADMINISTERED ACCORDING TO ERICSSON'S FIXED FEE BILLING PROCEDURE ESTABLISHED BY ERICSSON'S LETTER OF OCTOBER 15, 1997.

Please prepare and file a patent application in the U.S. Patent and Trademark Office on the above-referenced invention. A copy of the invention disclosure and inventor's questionnaire are enclosed. Any potential statutory bar dates should be identified in these documents; however, any potential bars should also be verified with the inventor. Please present a set of claims directed to the embodiment in which the mobile estimates its position using the cellular signals.

If you wish to discuss any matter regarding this application, please do not hesitate to contact me at (919) 472-1154. A first draft of the application should be submitted to the inventor within three months of the date of this letter. Please contact the inventor for technical assistance well in advance of the three month date. Please advise if there is any problem with this schedule.

Very truly yours,

Stephen A. Calogero
Intellectual Property Counsel

Enclosures

SAC99073

Ericsson Inc.
7001 Development Drive, P.O. Box 13969
Research Triangle Park, North Carolina 27709
(919) 472-7000

Coats & Bennett

PE JUL 07 2003 JC22 PATENT & TRADEMARK OFFICE

EXHIBIT 3

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Patents, Trademarks,
Copyrights, Trade Secrets,
Licensing, and
Related Litigation

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October 6, 1999

Mr. Alex Krister Raith
Ericsson, Inc.
6455 Lush Blvd
San Diego, CA 92121-2779

RE: U.S. Patent Application
Ericsson Ref. No.: P10569-US1-BMOT
Our Ref. No.: P-4015.398
Inventor(s): Alex Krister Raith
SYSTEM AND METHOD FOR IMPROVING CHANNEL MONITORING IN A CELLULAR SYSTEM

Dear Mr. Raith:

Enclosed please find the first draft of the above referenced application. Please review and fax me any changes or comments you may have.

Please do not hesitate to call if you have any questions.

Sincerely,

David E. Bennett

David E. Bennett

cc: Stephen A. Calogero

DEB/jjr
Enclosure
P-4015.398